CLAIMS

What is claimed is:

1. A method of identifying a gene or genes involved in transcription-dependent memory comprising the steps of:

(a) training non-human animals under conditions sufficient to induce transcription-dependent memory formation in said animals;

(b) extracting RNA from brain tissue of said animals trained in step (a);

(c) synthesizing DNA probes using the RNA extracted in step (b);

(d) exposing the DNA probes synthesized in step (c) to microarray chips containing DNA sequences from genes of the genome of said animals under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences;

(e) detecting the signal produced in step (d); and

(f) performing a statistical comparison between the signal detected in step (e) and the signal detected in a control, wherein said control is obtained according to a method comprising the steps of:

(i) training non-human control animals under appropriate conditions, wherein said conditions are insufficient to induce transcription-dependent memory formation in said control animals;

(ii) extracting RNA from brain tissue of said control animals trained in step (f)(i);

(iii) synthesizing DNA probes using the RNA extracted in step (f)(ii); and

(iv) exposing the DNA probes synthesized in step (f)(iii) to microarray chips containing DNA sequences from genes of the genome of control animals under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences.

2. The method of Claim 1 wherein said animal is a non-human mammal.

3. The method of Claim 1 wherein said transcription-dependent memory formation is long term memory formation.

4. The method of Claim 1 wherein transcription-dependent memory formation is induced using a spaced training protocol and the conditions of step (f)(i) are those according to a massed training protocol.

5. The method of Claim 1 wherein the conditions of step (f)(i) are those sufficient to induce transcription-independent memory formation but not transcription-dependent memory formation.

6. The method of Claim 5 wherein transcription-independent memory formation is induced using a massed training protocol.

7. The method of Claim 1 wherein transcription-dependent memory formation is induced using a shuttle-box avoidance training protocol, the control animals of step (f)(i) have a surgical lesion of the fornix and the conditions of step (f)(i) are those according to the shuttle-box avoidance training protocol.

8. The method of Claim 7 wherein said non-human animals are non-human mammals.

9. The method of Claim 1 wherein transcription-dependent memory formation is induced using a contextual fear conditioning training protocol, the control animals of step (f)(i) are habituated to the training chamber before training and the conditions of step (f)(i) are those according to the contextual fear conditioning training protocol.

10. The method of Claim 9 wherein said non-human animals are non-human mammals.

11. A method of identifying a gene or genes involved in transcription-dependent memory comprising the steps of:

(a) training Drosophila under conditions appropriate to induce transcription-dependent memory formation in said Drosophila;

(b) extracting RNA from head tissue of Drosophila trained in step (a);

(c) synthesizing DNA probes using the RNA extracted in step (b);

(d) exposing the DNA probes synthesized in step (c) to microarray chips containing DNA sequences from genes of the Drosophila genome under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences;

(e) detecting the signal produced in step (d); and

(f) performing a statistical comparison between the signal detected in step (e) and the signal detected in a control, wherein said control is obtained according to a method comprising the steps of:

(i) training control Drosophila under appropriate conditions, wherein said conditions are insufficient to induce transcription-dependent memory formation in said control Drosophila;

(ii) extracting RNA from head tissue of said control Drosophila trained in step (f)(i);

(iii) synthesizing DNA probes using the RNA extracted in step (f)(ii); and

(iv) exposing the DNA probes synthesized in step (f)(iii) to microarray chips containing DNA sequences from genes of the Drosophila genome under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences.

12. The method of Claim 11 wherein said transcription-dependent memory formation is long term memory formation.

13. The method of Claim 11 wherein transcription-dependent memory formation is induced using a spaced training protocol and the conditions of step (f)(i) are those according to a massed training protocol.

14. The method of Claim 11 wherein the conditions of step (f)(i) are those sufficient to induce transcription-independent memory formation but not transcription-dependent memory formation.

15. The method of Claim 14 wherein transcription-independent memory formation is induced using a massed training protocol.

16. A method of identifying a gene or genes involved in transcription-dependent memory comprising the steps of:

(a) training non-human animals under conditions sufficient to induce transcription-dependent memory formation in said animals;

(b) extracting RNA from brain tissue of said animals trained in step (a);

(c) synthesizing DNA probes using the RNA extracted in step (b);

(d) exposing the DNA probes synthesized in step (c) to microarray chips containing DNA sequences from genes of the genome of said animals under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences;

(e) detecting the signal produced in step (d); and

(f) performing a statistical comparison between the signal detected in step (e) and the signal detected in a control, wherein said control is obtained according to a method comprising the steps of:

(i) extracting RNA from brain tissue of non-human control animals;

(ii) synthesizing DNA probes using the RNA extracted in step (f)(i); and

(iii) exposing the DNA probes synthesized in step (f)(ii) to microarray chips containing DNA sequences from genes of the genome of control animals under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences.

17. The method of Claim 16 wherein said non-human animal is a non-human mammal.

18. The method of Claim 16 wherein said transcription-dependent memory formation is long term memory formation.

19. The method of Claim 16 wherein transcription-dependent memory formation is induced using a spaced training protocol.

20. The method of Claim 16 wherein transcription-dependent memory formation is induced using a shuttle-box avoidance training protocol.

21. The method of Claim 20 wherein said non-human animal is a non-human mammal.

22. The method of Claim 16 wherein transcription-dependent memory formation is induced using a contextual fear conditioning training protocol.

23. The method of Claim 22 wherein said non-human animal is a non-human mammal.

24. A method of identifying a gene or genes involved in transcription-dependent memory comprising the steps of:

(a) training Drosophila under conditions appropriate to induce transcription-dependent memory formation in said Drosophila;

(b) extracting RNA from head tissue of Drosophila trained in step (a);

(c) synthesizing DNA probes using the RNA extracted in step (b);

(d) exposing the DNA probes synthesized in step (c) to microarray chips containing DNA sequences from genes of the Drosophila genome under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a

signal is produced upon hybridization of said probes to complementary DNA sequences;

(e) detecting the signal produced in step (d); and

(f) performing a statistical comparison between the signal detected in step (e) and the signal detected in a control, wherein said control is obtained according to a method comprising the steps of:

(i) extracting RNA from head tissue of control Drosophila;

(ii) synthesizing DNA probes using the RNA extracted in step (f)(i); and

(iii) exposing the DNA probes synthesized in step (f)(ii) to microarray chips containing DNA sequences from genes of the Drosophila genome under conditions appropriate for hybridization of the DNA probes to complementary DNA sequences on the microarray chips, wherein a signal is produced upon hybridization of said probes to complementary DNA sequences.

25. The method of Claim 24 wherein said transcription-dependent memory formation is long term memory formation.

26. The method of Claim 24 wherein transcription-dependent memory formation is induced using a spaced training protocol.